VEGETATION OF THE WETLAND AND RIPARIAN AREAS OF PINE BUTTE PRESERVE, TETON COUNTY, MONTANA

by

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INTRODUCTION

The proposed Pine Butte Preserve occupies approximately 135 km^2 along the east front of the Rocky Mountains in northern Montana. The preserve includes mountains, foothill, and prairie landscapes. A conspicuous feature is the large wetland and riparian complex surrounding Pine Butte in the center of the preserve. Forest communities dominated by cottonwood and aspen (Populus) are common, stands of willow (Salix) follow the numerous small streams, and marshes and ponds occur throughout. The most outstanding wetland feature is the large mire complex consisting of patterned fen and associated carr. Biologists have recognized the importance of this complex for wildlife. Bear studies have been in progress for over four years. In addition to a diverse fauna, the area supports a rich flora sharply contrasted with the surrounding xeric grasslands.

The existence of a large patterned mire system so far south and in an area of arid climate is of great significance. The Pine Butte fens are outliers of vegetation communities characteristic of circumpolar boreal regions. The near-neutral pH and mineral-rich nature of the water in the fens allow the development of a high species diversity. Northern bog plants exist side by side with species from the adjacent prairies and mountains. The result is a unique floristic assemblage.

Bogs and fens have been much studied in Scandanavia, England, Canada, and the Great Lakes region of the United States. Good general reviews of peatlands are provided by Moore and Bellamy (1974) and Gorham (1957). Much of the early work on peatlands delineates communities and describes floristic composition (Conway 1949, Moss 1953, and Ritchie 1957). There is a large body of literature dealing with the relationship between mire vegetation and water chemistry (Jeglum 1971, Schwintzer and Tomberlin 1982, and Sjors 1950). The patterning typical of many boreal bogs and fens has been discussed by Heinselman (1963, 1970) and Sjors (1961).

The literature dealing with wetlands is much less extensive, but good studies dealing with ecology and classification have been done by Jeglum et al. (1974) and Stewart and Kantrud (1971).

The present research was initiated to provide a classification system and descriptions of the wetland and riparian communities present

on the Pine Butte Preserve and to compile and document a floristic inventory of these communities.

THE STUDY AREA

The study was conducted in the wetland and riparian areas of the proposed Pine Butte Preserve. The preserve is located in west-central Teton County, Montana 45 km west of Choteau at approximately 47°50' N latitude and 32°30' W longitude (Fig.1). The preserve extends from the east slope of the Rocky Mountains, including Ear Mtn. and Indian Head Rock, east to the confluence of McDonald Creek with the Teton River. It is bounded on the north by the Teton River Road. On the south the boundary follows approximately the Willow Creek drainage. Bedrock underlying the east half of the preserve is mainly shale of Cretaceous origin. The mountainous western half is formed of Paleozoic limestones and shales (Kleinkopf and Mudge 1972). Areas around Pine Butte and the Teton River are overlain by Tertiary and Quaternary glacial deposits (Alden 1953). Drainage is primarily from west to east. Major drainages are the Teton River, Willow Creek, and McDonald Creek. Mean annual precipitation is 430 mm and mean annual temperature is 6.0°C. The average frost-free season is 90 days (USDA 1980).

I concentrated my study on the large area of wetland and riparian vegetation surrounding Pine Butte. Communities include stands of broad-leaved trees such as cottonwood, aspen, and birch (Betula), stands of willow, streams, ponds, and a large expanse (ca. 1,200 ha) of fen. The fen on the west side of Pine Butte is referred to as the Duhr Fen, that on the north side as the McDonald Fen. Fen vegetation is developed mainly on peat 0.5-3.0 m thick which is usually underlain by a layer of gley (Woosner, personal communication). Pine Butte is situated in an expanse of glacial outwash. Water flowing from the Teton River through this permeable till rises to the surface in the area of the fens providing a nearly constant supply of nutrient enriched-water. Water movement is south by southeast in the Duhr Fen and east in the McDonald Fen (Woosner, personal communication). Surrounding upland vegetation is mixed-grass and foothills prairie dominated by grasses such as Agropyron, Festuca, Stipa, and Bouteloua. Localized uplifts support open forest dominated by Pinus flexilis.

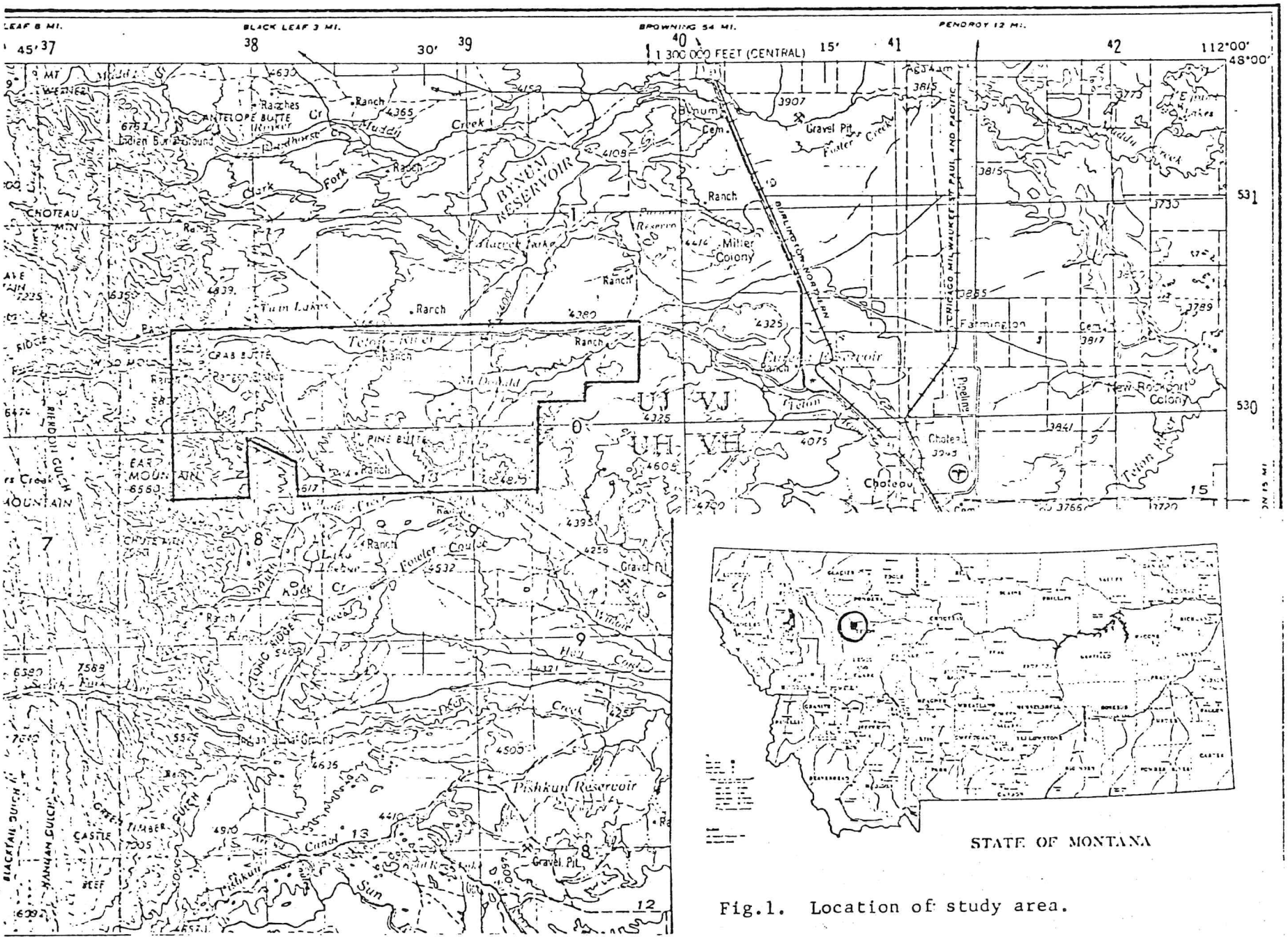

Fig.1. Location of study area.

METHODS

I conducted the study during seven trips to the study area from May 15 through September 15, 1982. I spent approximately 300 hours investigating the study area, taking notes on vegetational composition, and identifying plants. I did not include areas over 1,500 m or gravel bar communities along the Teton River in the floristic study. I collected approximately 240 voucher specimens which will be submitted to the Big Sky Field Office of the Nature Conservancy. Duplicates will be deposited at the University of Montana, Missoula (MONTU). Nomenclature follows Hitchcock and Cronquist (1976) for vascular plants and Crum et al. (1973) for bryophytes.

Using species-presence data from my field notes and the habitat type system used by the Grizzly Bear Recovery Team along the East Front (Aune 1982), I developed a community type system for the wetland and riparian areas of the Pine Butte Preserve. With the aid of infrared aerial photography I have mapped the location of these community types on mylar overlays of 1:12,000 topographic basemaps.

Since the fen vegetation is unique and displays complex patterning and species composition, I conducted vegetation sampling in the Duhr Fen during the last week in August. Sampling was carried out using the methods of Daubenmire (1959). For each stand I laid out a baseline 50 m long parallel to the direction of water flow and placed 20 plots 20X50 cm at regular intervals along this line. I estimated canopy coverage for each species by placing it in one of seven classes: T=0-1%, 1=2-5%, 2=6-25%, 3=26-50%, 4=51-75%, 5=76-95%, 6=96-100%. For each transect I determined average cover for each species by taking the mean of the midpoints of the recorded cover classes. I estimated average shrub height to the nearest dm. I determined pH and conductance values with water from natural depressions using portable conductance and pH meters. I subjectively placed ten transects in distinct and homogenous units of vegetation. Location of these transects is shown in Fig.2.

I determined dissolved oxygen in mid-October by fixing samples in the field and titrating in the lab employing the azide modification of the Winkler tecnique (APHA 1971).

Prominance Values (PV) were obtained by using the formula: $PV = C\sqrt{F}$ where C = % canopy cover, and F = absolute frequency (Beals 1960).

Index of Similarity values (S) were obtained using the formula: $S = 2w/a+b$ where w is the number of species common to both groups, a is the number of species in group A, and b is the number of species in group B (Curtis 1959).

RESULTS AND DISCUSSION

I have divided vegetation community types included in the study into three groups: riparian, wetland, and fen communities. Definitions of these terms overlap, and placement of community types into these categories is for the sake of convenience. The three groups are dealt with in turn.

Riparian Communities

- Black Cottonwood c.t.
- Narrow-leaved Cottonwood c.t.
- Dry Aspen c.t.
- Wet Aspen c.t.
- Dry Willow c.t.
- Wet Willow c.t.
- Montane Riparian c.t.

Wetland Communities

- Marsh c.t.
- Meadow c.t.
- Pond c.t.
- Prairie Pond c.t.

Fen Communities

- Open Fen c.t.
- Carr c.t.
- Dwarf Carr c.t.

A community type delineates vegetation units as they exist at the present time rather than units of potential vegetation (habitat types).

Duhr and McDonald fens and along McDonald Creek and the North Fork of Willow Creek. Surface water is present only during the Spring, and there is usually very little accumulation of peat. Vegetation is shorter than in the Marsh community type.

Stands are characterized by a closed cover of graminoids such as Juncus balticus, Eleocharis palustris, Deschampsia caespitosa, Hordeum jubatum, Agrostis alba, Poa pratensis, Festuca pratensis, Phleum pratense, Glyceria grandis, Carex lanuginosa, and C. nebrascensis. Crepis runcinata, Plantago eriopoda, Triglochin maritima, Zigadenus elegans, Aster occidentalis, Mentha arvensis, Cicuta douglasii, Taraxacum officinale, and Phlox kelseyi var. kelseyi are common forbs.

Jeglum (1974) states that there is nomenclatural confusion between the terms "meadow" and "graminoid fen" in the literature. In his system fens are underlain by accumulations of peat while meadows are not. In the Pine Butte area graminoid fens are also characterized by the importance of bryophytes.

Pond community type

This community type is found in the open water of ponds, sloughs, and slow-moving streams throughout the study area. This type ordinarily merges with the Marsh community type in shallow water.

Common floating plants are Potamogeton nodosus, P. filiformis, P. pectinatus, Callitriche heterophylla, Myriophyllum spicatum var. exalbescens, Polygonum amphibium, Ranunculus aquatilis, R. gmelinii, and Sparganium emersum. Hippuris vulgaris, Veronica catenata, and Sagittaria cuneata are common emergents. Utricularia vulgaris is a common submerged species.

Prairie Pond community type

This community type is characteristic of the drying mud found along margins of ponds and sloughs demonstrating large annual fluctuations of water level. Vegetation associated with intermittent ponds usually has a large annual forb component, while permanent ponds are characterized by a greater coverage of rhizomatous graminoids. This community type is absent around fen ponds and most beaver ponds.

Common perennial graminoids are Hordeum jubatum, Puccinelia distans, Poa juncifolia, Scirpus americanus, Juncus alpinus, J. nodosus,